# PLAY & LEARN

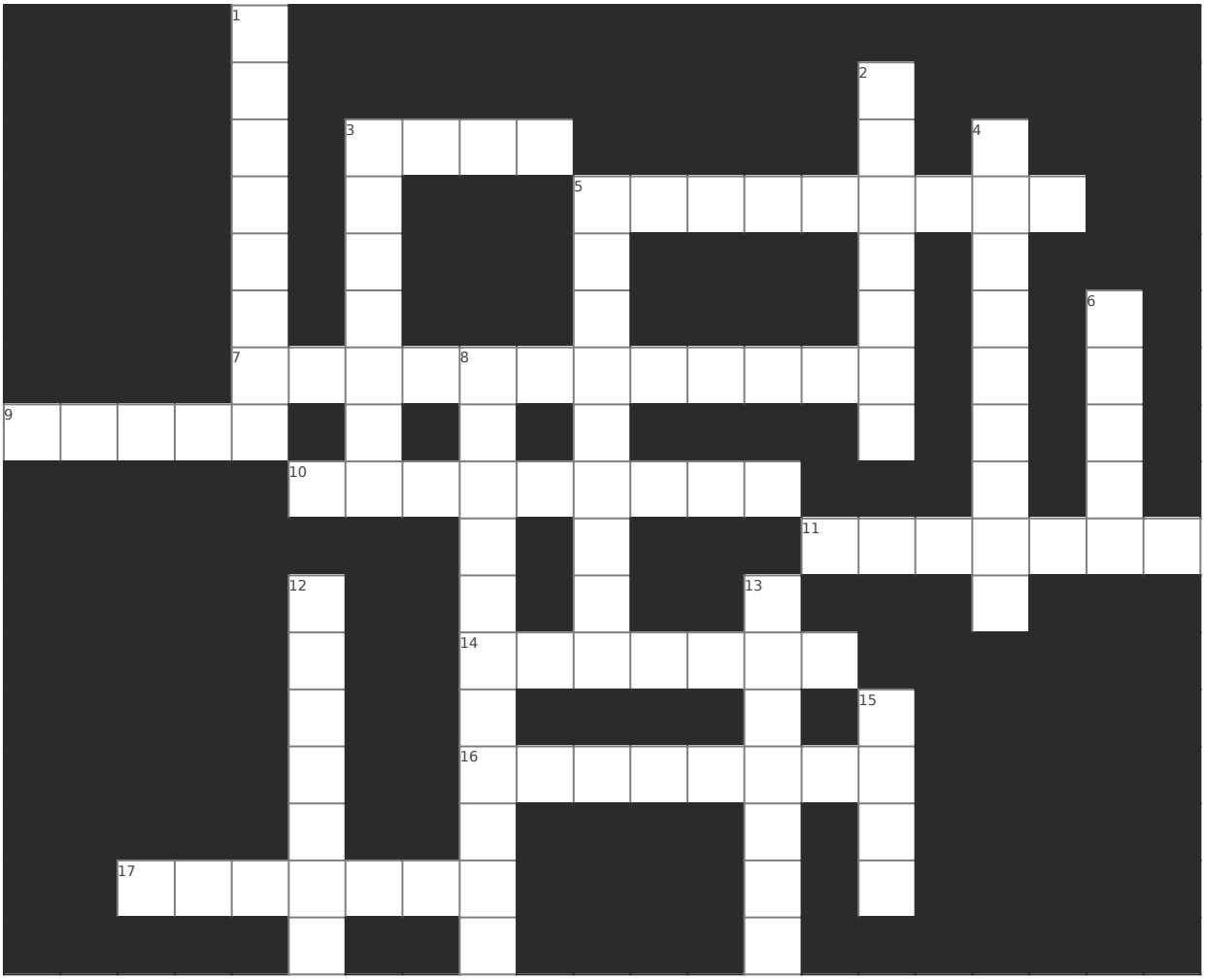
A puzzle workbook — crosswords, word searches, scrambles and quiz games

*Print it. Solve it. Race a friend. Answer keys are at the back — no peeking.*

| # | Puzzle | Play it | Time |
|---|---|---|---|
| 1 | The Organelle Crossword | Solo or pairs | 15 min |
| 2 | Cell Safari Word Search | Solo — race the clock | 10 min |
| 3 | Scrambled Organelles | Solo | 8 min |
| 4 | Odd One Out | Teams of 4 | 10 min |
| 5 | Cell Scrabble | Groups of 3–4 | 20 min |
| 6 | Who Am I? — 20 Clue Cards | Whole class | 15 min |
| 7 | True or False Sprint | Whole class, standing | 6 min |
| 8 | Cell Bingo | Whole class | 15 min |
| 9 | Two Truths and a Lie | Pairs | 10 min |
| 10 | The Escape-the-Cell Challenge | Teams of 4 | 25 min |

# Puzzle 1 · The Organelle Crossword

*Every answer is a word from Chapter 2. Fill the white squares — one letter per square.*



## ACROSS

**3.** The basic unit of all life (4)

**5.** Tangled thread form of DNA in a resting cell (9)

**7.** The powerhouse of the cell (12)

**9.** He first saw and named cells, in 1665 (5)

**10.** What a plant cell wall is mainly made of (9)

**11.** Division that makes four cells, chromosomes halved (7)

**14.** Movement of water across a selective membrane (7)

**16.** The cell’s clean-up and recycling sac (8)

**17.** The control room holding the DNA (7)

## DOWN

**1.** Tiny structure where proteins are made (8)

**2.** A shape whose part looks like the whole (7)

**3.** Folds of the inner mitochondrial membrane (7)

**4.** Movement from high to low concentration (9)

**5.** The jelly-like substance filling the cell (9)

**6.** Apparatus that packs and dispatches (5)

**8.** Green plastid where photosynthesis happens (11)

**12.** Storage sac that keeps a plant cell firm (7)

**13.** Division that makes two identical cells (7)

**15.** A functional segment of DNA (4)

*Bonus words that did not fit the grid — define each one in a sentence: ATP*

# Puzzle 2 · Cell Safari Word Search

*18 terms are hiding in the grid — across, down, diagonally, and backwards. Circle each one, then tick it off the list. Beat 10 minutes and you have earned your microscope.*

| C | E | L | L | W | A | L | L | D | T | U | R | G | O | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | Y | T | F | R | A | C | T | A | L | V | P | I | A | L |
| J | E | V | O | S | M | O | S | I | S | T | G | Q | F | Y |
| E | K | V | O | S | U | E | L | C | U | N | D | N | A | P |
| M | H | K | M | V | I | G | U | S | I | S | O | T | I | M |
| O | N | Z | Z | Y | G | G | S | I | S | O | I | E | M | M |
| S | P | L | A | S | T | I | D | H | S | K | G | E | E | P |
| O | L | B | E | M | O | S | O | B | I | R | I | W | C | I |
| S | F | D | O | E | N | Z | Y | M | E | P | G | I | G | N |
| Y | M | U | K | Q | S | T | R | O | M | A | L | P | V | K |
| L | W | O | E | N | E | G | T | O | K | C | O | B | I | T |
| B | O | V | W | C | R | I | S | T | A | E | G | I | S | L |
| H | J | U | Z | S | A | U | E | M | O | G | A | Y | I | H |
| Y | E | Z | B | U | D | O | D | U | R | U | U | Z | L | C |
| V | G | G | P | I | F | W | E | L | O | U | C | A | V | A |

| | | |
|---|---|---|
| ☐ RIBOSOME | ☐ LYSOSOME | ☐ CELLWALL |
| ☐ NUCLEUS | ☐ VACUOLE | ☐ CRISTAE |
| ☐ PLASTID | ☐ OSMOSIS | ☐ MITOSIS |
| ☐ MEIOSIS | ☐ FRACTAL | ☐ STROMA |
| ☐ ENZYME | ☐ TURGOR | ☐ GOLGI |
| ☐ HOOKE | ☐ GENE | ☐ DNA |

### Race Rules

- **Solo:** find all 18. Note your time at the top of the page.
- **Pairs:** one partner finds across-and-down words, the other finds diagonals. First pair to complete the list wins.
- **Hard mode:** cover the word list. Find as many biology terms as you can in 5 minutes.
- **Champion move:** for every word you find, say its function out loud. No function, no point.

# Puzzle 3 · Scrambled Organelles

*Every row is a Chapter 2 word with its letters shuffled. Unscramble it. The clue in brackets is your lifeline — try to solve without it first.*

| # | Scrambled letters | Clue | Your answer |
|---|---|---|---|
| 1 | R S C H O M O E M O | (rod-shaped, visible just before division) | _____ |
| 2 | T E Y O P K R R A O | (a cell with no true nucleus) | _____ |
| 3 | E M M A B R N E | (the selectively permeable boundary) | _____ |
| 4 | R R U G T O | (the pressure that keeps a plant firm) | _____ |
| 5 | R S I N A N F A | (the red stain used on onion peel) | _____ |
| 6 | A M A B O E | (moves by flowing, has no cell wall) | _____ |
| 7 | E I T M R P L O H H E | (heat-loving bacterium of Puga Valley) | _____ |
| 8 | K O C L E T E Y S T O N | (the fine fibre network inside a cell) | _____ |
| 9 | O I T E N C T O P T Y | (one plant cell can regrow a whole plant) | _____ |
| 10 | B O Y S D I O M I E N S S | (how mitochondria may have joined the cell) | _____ |

### Make It a Game

**Beat the Bell:** the teacher sets a 60-second timer. Every unscrambled word inside the bell = 1 point; a word you can also *define* = 3 points.

**Chain Scramble:** in a circle, each student scrambles a Chapter 2 word for the person on their left. Miss it and you are out. Last student standing wins.

# Puzzle 4 · Odd One Out

*Three belong together. One does not. Circle the odd one — then write why in one line. The "why" is where the marks are.*

| # | Which is the odd one out? | Because… |
|---|---|---|
| 1 | Nucleus · Mitochondrion · Cell wall · Golgi apparatus | _____ |
| 2 | Chlorophyll · Chromoplast · Leucoplast · Ribosome | _____ |
| 3 | Hooke · Schleiden · Schwann · Newton | _____ |
| 4 | Osmosis · Diffusion · Photosynthesis · Concentration gradient | _____ |
| 5 | Bacteria · Yeast · Virus · Amoeba | _____ |
| 6 | Cristae · Villi · Alveoli · Cell sap | _____ |
| 7 | Mitosis · Meiosis · Gametes · Chromosome halving | _____ |
| 8 | Onion peel · Cheek cell · Spinach leaf · Potato cell | _____ |

# Puzzle 5 · Cell Scrabble

*Play in groups of 3–4. You have one shared rack of letter tiles. Build only biology terms from Chapter 2 — no ordinary English words allowed.*

**Your tile rack — cut these out or write them on paper squares:**

| | | | | | | |
|---|---|---|---|---|---|---|
| **A** 1 | **B** 3 | **C** 3 | **D** 2 | **E** 1 | **G** 2 | **H** 4 |
| **I** 1 | **L** 1 | **M** 3 | **N** 1 | **O** 1 | **P** 3 | **R** 1 |
| **S** 1 | **T** 1 | **U** 1 | **V** 4 | **X** 8 | **Y** 4 | **Z** 10 |

**Scoring:**

| You did this | Points |
|---|---|
| Each letter tile used | Its tile value |
| Word is a Chapter 2 term | × 2 |
| Word is 8 letters or longer | + 10 bonus |
| You can state its function correctly | + 5 |
| You can name where in the cell it sits | + 3 |
| Word is *not* in Chapter 2 (challenged and lost) | − 5 |

### How a Round Works

1. Player builds a word from the rack and lays it down.
2. Any opponent may **challenge** within 10 seconds: "That's not in Chapter 2."
3. Open the textbook. If the challenger is right, the word is removed and the builder loses 5 points. If the challenger is wrong, the *challenger* loses 5 points.
4. Builder states the function to claim the +5 bonus. The group votes on whether it was correct.
5. Play 6 rounds. Highest total wins.

### Target Words (worth the most — do not show your opponents)

MITOCHONDRIA · ENDOSYMBIOSIS · TOTIPOTENCY · CYTOSKELETON · CHROMOPLAST · SELECTIVELY PERMEABLE · PROKARYOTE · CHLOROPLAST · HYPERTONIC · CENTRIFUGE

# Puzzle 6 · Who Am I? — 20 Clue Cards

*Cut along the lines. One student draws a card and reads only the first clue aloud; the class guesses. Wrong guess? Read clue 2. Fewer clues used = more points.*

| | |
|---|---|
| **CARD 1** ① I am folded over and over. ② I make the cell's energy. ③ They call me the powerhouse. | **CARD 2** ① I am green. ② I trap sunlight. ③ Without me, no photosynthesis. |
| **CARD 3** ① I am a sac full of enzymes. ② I break down the broken. ③ The cell's recycling van. | **CARD 4** ① I am the biggest thing in a plant cell. ② I am full of watery sap. ③ When I empty, the plant wilts. |
| **CARD 5** ① I am rigid, and only plants, fungi and bacteria have me. ② I am made of cellulose. ③ I stop the cell from bursting. | **CARD 6** ① I hold the instructions. ② I have pores in my double coat. ③ I am the control room. |
| **CARD 7** ① I am tiny and I come in two subunits. ② I sit free or stuck to the ER. ③ I build proteins. | **CARD 8** ① I stack like flattened pouches. ② I wrap and label. ③ I am the cell's post office. |
| **CARD 9** ① I am water on the move. ② I need a selectively permeable membrane. ③ Salt on kairi proves I exist. | **CARD 10** ① I make two, not four. ② My daughters are identical. ③ I heal your cuts. |
| **CARD 11** ① I make four, not two. ② I halve the chromosome number. ③ Without me, no variation. | **CARD 12** ① I look like a tangled thread. ② I condense before division. ③ Then I become a chromosome. |
| **CARD 13** ① I have no nucleus and I live in your curd. ② I double every 20 minutes. ③ I am Lactobacillus. | **CARD 14** ① I am not a cell at all. ② I am genetic material in a protein coat. ③ I must invade to multiply. |
| **CARD 15** ① I looked at cork in 1665. ② I thought of monks' rooms. ③ I named the cell. | **CARD 16** ① I said all plants are made of cells. ② The year was 1838. ③ My partner did animals a year later. |
| **CARD 17** ① I proved cells come only from cells. ② The year was 1855. ③ I completed the Cell Theory. | **CARD 18** ① Any part of me, magnified, looks like all of me. ② Trees, coastlines and lungs wear my pattern. ③ I am a fractal. |
| **CARD 19** ① I am 70 square metres folded into your chest. ② I do gas exchange. ③ I am the alveoli. | **CARD 20** ① I lost my nucleus to carry more oxygen. ② I live about 120 days. ③ I am a red blood cell. |

**Scoring:** guessed after clue ① = **5 points** · after ② = **3 points** · after ③ = **1 point**

# Puzzle 7 · True or False Sprint

*Everyone stands. Teacher reads a statement. True → stay standing. False → sit down. Get it wrong and you are out. Last student standing wins.*

| # | Statement | Your call |
|---|---|---|
| 1 | All cells have a nucleus. | ☐ True ☐ False |
| 2 | The cell wall is made of cellulose. | ☐ True ☐ False |
| 3 | Osmosis needs a selectively permeable membrane. | ☐ True ☐ False |
| 4 | Viruses are the smallest living cells. | ☐ True ☐ False |
| 5 | Mitochondria have their own DNA. | ☐ True ☐ False |
| 6 | Animal cells have a large central vacuole. | ☐ True ☐ False |
| 7 | Meiosis produces four daughter cells. | ☐ True ☐ False |
| 8 | Robert Hooke saw living cells under his microscope. | ☐ True ☐ False |
| 9 | Cristae increase the surface area for making ATP. | ☐ True ☐ False |
| 10 | A potato in salt water gains weight. | ☐ True ☐ False |
| 11 | Cancer cells ignore contact inhibition. | ☐ True ☐ False |
| 12 | Chloroplasts are found in every plant cell. | ☐ True ☐ False |
| 13 | A fractal looks the same at different magnifications. | ☐ True ☐ False |
| 14 | The lysosome builds proteins. | ☐ True ☐ False |
| 15 | Bacteria are prokaryotic. | ☐ True ☐ False |
| 16 | Programmed cell death is always harmful. | ☐ True ☐ False |

# Puzzle 8 · Cell Bingo

*Each student fills the empty grid below with any 16 words from the word bank — in any order, one per box. The teacher then reads out functions, not names. Cross a box only when its function is called. First to a full row, column or diagonal shouts BINGO.*

**Word bank — choose any 16:**

| | | | |
|---|---|---|---|
| Nucleus | Mitochondria | Ribosome | Lysosome |
| Golgi apparatus | Vacuole | Chloroplast | Cell wall |
| Cell membrane | Cytoplasm | Chromosome | Gene |
| Osmosis | Diffusion | Mitosis | Meiosis |
| Cristae | Chromatin | Prokaryote | Eukaryote |
| Cellulose | ATP | Nucleolus | Plastid |

**Your bingo card:**

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

> **□ Caller’s List (teacher only — read the function, never the name)**
>
> ① "I release energy as ATP." ② "I am made of cellulose." ③ "I package and dispatch proteins." ④ "I store cell sap and keep the plant firm." ⑤ "I break down worn-out organelles." ⑥ "I build proteins." ⑦ "I hold the DNA." ⑧ "I trap sunlight." ⑨ "I am the jelly everything floats in." ⑩ "I decide what enters and leaves." □ "Water crosses me from dilute to concentrated." □ "I halve the chromosome number." □ "I make two identical daughter cells." □ "I am the folded inner membrane." □ "I am a cell with no true nucleus." □ "I am a functional segment of DNA."

# Puzzle 9 · Two Truths and a Lie

*Each set has three statements. Two are true, one is a lie. Circle the lie — and correct it in one line.*

### Set 1

(a) Mitochondria have their own DNA.
(b) Chloroplasts are found in all plant cells.
(c) Both mitochondria and chloroplasts have double membranes.

The lie is _____ . Corrected: _____

### Set 2

(a) A cheek cell has no cell wall.
(b) An onion cell shrinks completely in sugar solution.
(c) Cheek cells are used in DNA testing kits.

The lie is _____ . Corrected: _____

### Set 3

(a) Prokaryotes are 1–10 µm across.
(b) Prokaryotes have membrane-bound organelles.
(c) Bacteria are prokaryotes.

The lie is _____ . Corrected: _____

### Set 4

(a) The alveoli of your lungs total about 70 $m^2$.
(b) Folding increases surface area without increasing volume much.
(c) A smooth membrane would give the same surface area as cristae.

The lie is _____ . Corrected: _____

### Set 5

(a) Meiosis happens in all body cells.
(b) Meiosis produces gametes.
(c) Meiosis creates genetic variation.

The lie is _____ . Corrected: _____

### Set 6

(a) Robert Hooke named the cell in 1665.
(b) Virchow showed cells arise from pre-existing cells.
(c) Schleiden proved all animals are made of cells.

The lie is _____ . Corrected: _____

# Puzzle 10 · Escape the Cell

*You have been shrunk and injected into a plant cell. To escape you must pass five gates. Each gate gives you one digit. Collect all five to unlock the exit code.*

### GATE 1 — The Membrane

How many nanometres thick is a cell membrane, at the lower end of the range? That number is your **first digit**.

**Digit:** ☐

### GATE 2 — The Powerhouse

Count the letters in the folds of the inner mitochondrial membrane (the word itself). That count minus 0 is your **second digit**.

**Digit:** ☐

### GATE 3 — The Nucleus

A mature red blood cell survives about 120 days. Take the first digit of that number. That is your **third digit**.

**Digit:** ☐

### GATE 4 — The Wall

In which year did Robert Hooke name the cell? Add the last two digits together (6 + 5). That is your **fourth digit**.

**Digit:** ☐

### GATE 5 — The Fractal Gate

How many times do the bronchioles of a human lung branch? Take the first digit. That is your **fifth digit**.

**Digit:** ☐

**EXIT CODE:** ☐ ☐ ☐ ☐ ☐

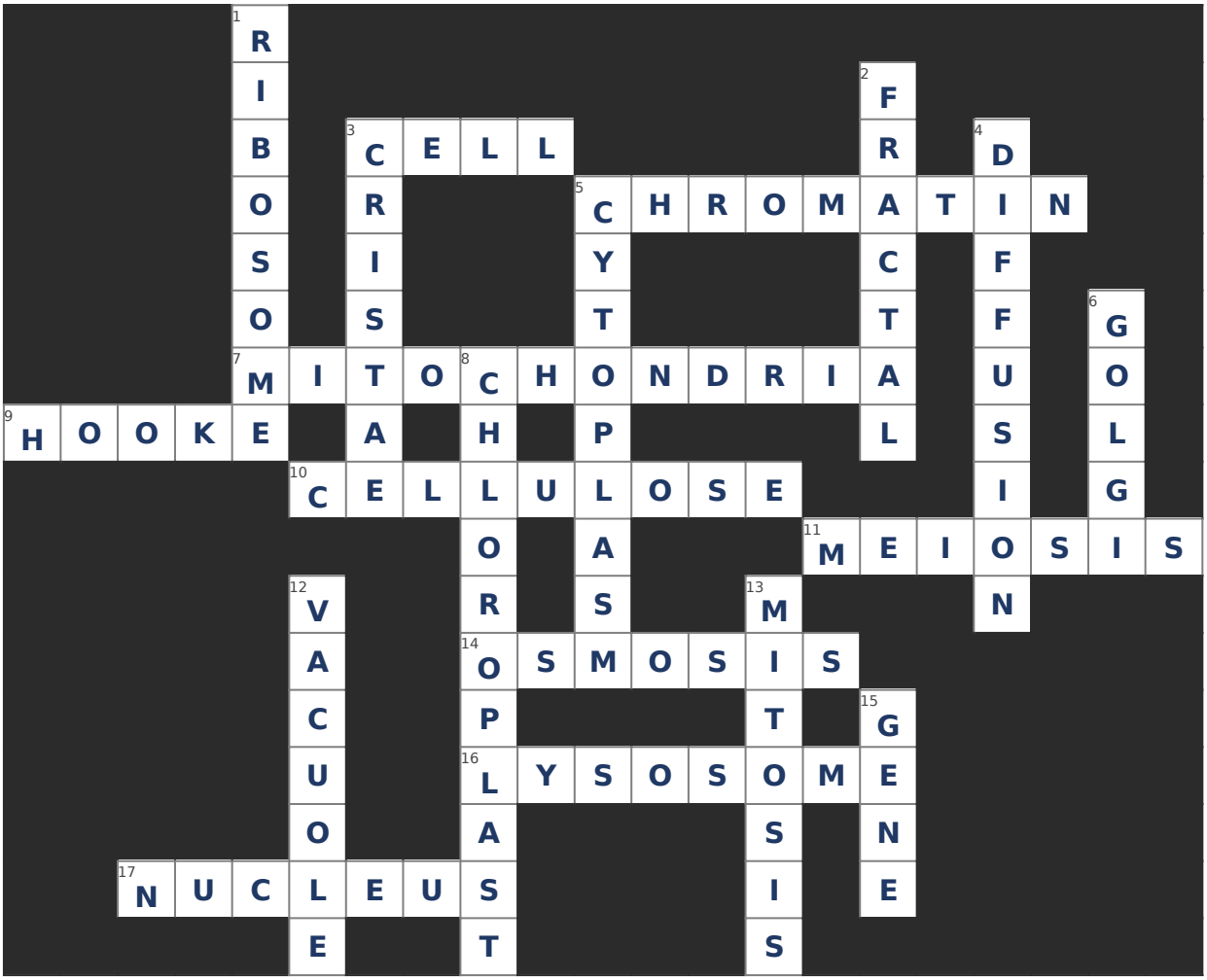
### Teacher's note

Hide the five gate cards around the classroom. Teams rotate every 4 minutes. First team to reach the door with the correct five-digit code escapes the cell. Losing teams get "reabsorbed by a lysosome."

# Answer Keys

*Teachers and self-checkers only. Solve first — the puzzle is the point.*

## Puzzle 1 · Crossword — Solved Grid


1 R I B O S O
2 F R A C T T
3 C E L L
R I S
4 D I F F U S I O N
5 C H R O M A T I N
Y T
6 G O L G I
7 M I T O C H O N D R I A
8 H O O K E
H A P L
9 C E L L U L O S E
10 O A
11 M E I O S I S
12 V A C U O L E
R S
13 M N
14 O S M O S I S
P T
15 G E N E
16 L Y S O S O M E
A S
17 N U C L E U S
I
S

**Across:** 3 CELL · 5 CHROMATIN · 7 MITOCHONDRIA · 9 HOOKE · 10 CELLULOSE · 11 MEIOSIS · 14 OSMOSIS · 16 LYSOSOME · 17 NUCLEUS

**Down:** 1 RIBOSOME · 2 FRACTAL · 3 CRISTAE · 4 DIFFUSION · 5 CYTOPLASM · 6 GOLGI · 8 CHLOROPLAST · 12 VACUOLE · 13 MITOSIS · 15 GENE

## Puzzle 2 · Word Search — Solved Grid

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **C** | **E** | **L** | **L** | **W** | **A** | **L** | **L** | D | **T** | **U** | **R** | **G** | **O** | **R** |
| P | Y | T | **F** | **R** | **A** | **C** | **T** | **A** | **L** | V | P | I | A | L |
| J | E | V | **O** | **S** | **M** | **O** | **S** | **I** | **S** | T | G | Q | F | Y |
| **E** | K | V | O | **S** | **U** | **E** | **L** | **C** | **U** | **N** | **D** | **N** | **A** | P |
| **M** | H | K | M | V | I | G | U | **S** | **I** | **S** | **O** | **T** | **I** | **M** |
| **O** | N | Z | Z | Y | G | G | **S** | **I** | **S** | **O** | **I** | **E** | **M** | M |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S** | **P** | **L** | **A** | **S** | **T** | **I** | **D** | H | S | K | G | E | E | P |
| **O** | L | B | **E** | **M** | **O** | **S** | **O** | **B** | **I** | **R** | **I** | W | C | I |
| **S** | F | D | O | **E** | **N** | **Z** | **Y** | **M** | **E** | P | **G** | I | G | N |
| **Y** | M | U | **K** | Q | **S** | **T** | **R** | **O** | **M** | **A** | **L** | P | V | K |
| **L** | W | **O** | **E** | **N** | **E** | **G** | T | O | K | C | **O** | B | I | T |
| B | **O** | V | W | **C** | **R** | **I** | **S** | **T** | **A** | **E** | **G** | I | S | L |
| **H** | J | U | Z | S | A | U | E | M | O | G | A | Y | I | H |
| Y | E | Z | B | U | D | O | D | U | R | U | U | Z | L | C |
| V | G | G | P | I | F | W | **E** | **L** | **O** | **U** | **C** | **A** | **V** | A |

## Puzzle 3 · Scrambled Organelles

1. CHROMOSOME · 2. PROKARYOTE · 3. MEMBRANE · 4. TURGOR · 5. SAFRANIN · 6. AMOEBA · 7. THERMOPHILE · 8. CYTOSKELETON · 9. TOTIPOTENCY · 10. ENDOSYMBIOSIS

## Puzzle 4 · Odd One Out

| # | Odd one | Because |
|---|---|---|
| 1 | Cell wall | The only one absent from animal cells |
| 2 | Ribosome | The only one that is not a plastid/pigment |
| 3 | Newton | The only one who is not a cell biologist |
| 4 | Photosynthesis | The only one not a transport process |
| 5 | Virus | The only one that is not a cell |
| 6 | Cell sap | The only one that is not a folded surface |
| 7 | Mitosis | The only one not connected with halving/gametes |
| 8 | Cheek cell | The only animal cell — the rest are plant cells |

## Puzzle 7 · True or False Sprint

1-F · 2-T · 3-T · 4-F · 5-T · 6-F · 7-T · 8-F · 9-T · 10-F · 11-T · 12-F · 13-T · 14-F · 15-T · 16-F

## Puzzle 9 · Two Truths and a Lie

| Set | The lie | Correction |
|---|---|---|
| 1 | (b) | Chloroplasts are absent from root cells and other non-green tissue |

| Set | The lie | Correction |
|---|---|---|
| 2 | (b) | The onion cell’s wall keeps its outline; only the contents shrink |
| 3 | (b) | Prokaryotes have no membrane-bound organelles |
| 4 | (c) | A smooth membrane would give far less surface area than folded cristae |
| 5 | (a) | Meiosis happens only in reproductive organs |
| 6 | (c) | Schleiden did plants; Schwann did animals |

## Puzzle 10 · Escape the Cell

### EXIT CODE: 7 · 7 · 1 · 1 · 2

Gate 1: membrane is 7–10 nm thick → 7. Gate 2: CRISTAE has 7 letters → 7. Gate 3: 120 days → 1. Gate 4: 1665 → 6+5 = 11 → 1. Gate 5: 23 branchings → 2.

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*Now go build the clay cell model — and see if you can fold the cristae enough times to beat your own record. □□*